
AASHTO T 217 - DETERMINATION OF MOISTURE IN SOIL BY MEANS OF CALCIUM CARBIDE GAS PRESSURE MOISTURE TESTER (SPEEDY)

Conduct this procedure according to AASHTO T 217, NDDOT Modified.

The standard test procedure calls for the moisture content to be recorded to the nearest whole number. The NDDOT modification is to record the moisture content number to the nearest 0.1.

Consult the current edition of AASHTO for procedure in its entirety and equipment specification details.

SCOPE

This test used to determine the moisture content of soils by means of a calcium carbide gas pressure moisture tester in the field. The tester is referred to as the "Speedy". This method shall not be used for granular material having particles retained on the No. 4 (4.75 mm) sieve.

Use care when performing this test and working with the calcium chloride reagent. The reagent has an expiration date and should be verified before using. Tightly close reagent cans when not in use.

Use [DOT 13942](#), "Conversion Chart for the Speedy Tester," to convert the reading on the tester dial.

REFERENCED DOCUMENTS

AASHTO T 265, Laboratory Determination of Moisture Content of Soils

APPARATUS

Calcium carbide pressure moisture tester "Speedy", which includes a balance, steel balls, and cleaning brush.

Calcium carbide reagent and scoop to measure reagent.

PROCEDURE

Instructions are written for a 20 to 26 g tester. There are various models of the "Speedy" in use with slight variations in instructions. Some models include 1.25" steel balls others use 1" steel balls. Manufacturer's instructions may tell you to put the reagent in the body, others the cap. Either method may be used as long as the soil and reagent are not mixed before securing the cover.

Read and follow T 217 and the manufacturer's instructions to conduct this test.

The following describes the T 217 method for conducting the test.

Before beginning the test, verify the inside of the body and cap are free from residue of any previous test.

Place the steel balls into the body.

Take three full measures of reagent and place in body of vessel. For bulky materials, use three to five measures to ensure adequate coverage.

Measure your sample. The sample size needed is determined by the manufacturer of your tester.

Your tester kit may have an electronic balance or a beam balance. For a beam balance, lift into an upright position and add material to the pan. The correct amount of material is determined when the red markings on the balance and beam coincide.

Place the sample in the cover of the "Speedy".

Hold the "Speedy" in a horizontal position and place the cover on the end. Bring the stirrup in position and tighten. This should be completed without the sample and reagent coming in contact with each other.

Hold vertically so that the material in the cap falls into the "Speedy" body. Return the instrument to a horizontal position, shake to break all lumps, and mix the soil and reagent. Shake with a rotating motion to put the steel balls into 'orbit' around the inside circumference. Rotate for 10 seconds, rest for 20 seconds. The rest time allows for dissipation of the heat generated by the chemical reaction. Continue this cycle for a minimum of 3 minutes.

When the needle stops moving, hold the instrument horizontal at eye level with the dial facing you. Read and record the dial reading to the nearest 0.1.

Hold tester away from your body. Point the directional release away from you and anyone else, then slowly release the pressure. Avoid breathing the fumes. Empty the contents and examine for lumps. If material contains lumps, repeat the test.

Thoroughly clean the tester with the brush provided.

CALCULATIONS

The dial reading is percent moisture by wet mass and needs to be converted to dry mass using form [DOT 13942](#).

REPORT

Report the percent moisture to the 0.1%.

NOTES

If the moisture content of the soil sample is greater than the ability for the gauge to read, run the test using a one-half size sample. The dial reading is multiplied by two and then converted to dry mass using [DOT 13942](#).

CALIBRATION

Calibration is to be done annually as a minimum, and whenever damage or repair occurs. This can be accomplished by comparing the “Speedy” results to a sample oven-dried according to T 265. Calibration will result in verifying [DOT 13942](#), “Conversion Chart for the Speedy Tester.”

CONVERSION CHART FOR SPEEDY TESTER

North Dakota Department of Transportation, Materials & Research

DOT 13942 (Rev. 05-2000)

WET WT. %	DRY WT. %								
1.0 - 1.0		7.0 - 7.5		13.0 - 14.9		19.0 - 23.5		25.0 - 33.3	
1.1 - 1.1		7.1 - 7.6		13.1 - 15.1		19.1 - 23.7		25.1 - 33.5	
1.2 - 1.2		7.2 - 7.7		13.2 - 15.2		19.2 - 23.8		25.2 - 33.7	
1.3 - 1.3		7.3 - 7.9		13.3 - 15.3		19.3 - 23.9		25.3 - 33.9	
1.4 - 1.4		7.4 - 8.0		13.4 - 15.5		19.4 - 24.1		25.4 - 34.0	
1.5 - 1.5		7.5 - 8.1		13.5 - 15.6		19.5 - 24.2		25.5 - 34.2	
1.6 - 1.6		7.6 - 8.2		13.6 - 15.7		19.6 - 24.4		25.6 - 34.4	
1.7 - 1.7		7.7 - 8.3		13.7 - 15.9		19.7 - 24.5		25.7 - 34.6	
1.8 - 1.8		7.8 - 8.5		13.8 - 16.0		19.8 - 24.7		25.8 - 34.8	
1.9 - 1.9		7.9 - 8.6		13.9 - 16.1		19.9 - 24.8		25.9 - 35.0	
2.0 - 2.0		8.0 - 8.7		14.0 - 16.3		20.0 - 25.0		26.0 - 35.1	
2.1 - 2.1		8.1 - 8.8		14.1 - 16.4		20.1 - 25.2		26.1 - 35.3	
2.2 - 2.2		8.2 - 8.9		14.2 - 16.6		20.2 - 25.3		26.2 - 35.5	
2.3 - 2.4		8.3 - 9.1		14.3 - 16.7		20.3 - 25.5		26.3 - 35.7	
2.4 - 2.5		8.4 - 9.2		14.4 - 16.8		20.4 - 25.6		26.4 - 36.9	
2.5 - 2.6		8.5 - 9.3		14.5 - 17.0		20.5 - 25.8		26.5 - 36.1	
2.6 - 2.7		8.6 - 9.4		14.6 - 17.1		20.6 - 25.9		26.6 - 36.2	
2.7 - 2.8		8.7 - 9.5		14.7 - 17.2		20.7 - 26.1		26.7 - 36.4	
2.8 - 2.9		8.8 - 9.6		14.8 - 17.4		20.8 - 26.3		26.8 - 36.6	
2.9 - 2.9		8.9 - 9.8		14.9 - 17.5		20.9 - 26.4		26.9 - 36.8	
3.0 - 3.1		9.0 - 9.9		15.0 - 17.6		21.0 - 26.6		27.0 - 37.0	
3.1 - 3.2		9.1 - 10.0		15.1 - 17.8		21.1 - 26.7		27.1 - 37.2	
3.2 - 3.3		9.2 - 10.1		15.2 - 17.9		21.2 - 26.9		27.2 - 37.4	
3.3 - 3.4		9.3 - 10.3		15.3 - 18.1		21.3 - 27.1		27.3 - 37.6	
3.4 - 3.5		9.4 - 10.4		15.4 - 18.2		21.4 - 27.2		27.4 - 37.7	
3.5 - 3.6		9.5 - 10.5		15.5 - 18.3		21.5 - 27.4		27.5 - 37.9	
3.6 - 3.7		9.6 - 10.6		15.6 - 18.5		21.6 - 27.6		27.6 - 38.1	
3.7 - 3.8		9.7 - 10.7		15.7 - 18.6		21.7 - 27.7		27.7 - 38.3	
3.8 - 4.0		9.8 - 10.9		15.8 - 18.8		21.8 - 27.9		27.8 - 38.5	
3.9 - 4.1		9.9 - 11.0		15.9 - 18.9		21.9 - 28.0		27.9 - 38.7	
4.0 - 4.2		10.0 - 11.1		16.0 - 19.0		22.0 - 28.2		28.0 - 38.9	
4.1 - 4.3		10.1 - 11.2		16.1 - 19.2		22.1 - 28.4		28.1 - 39.1	
4.2 - 4.4		10.2 - 11.4		16.2 - 19.3		22.2 - 28.5		28.2 - 39.3	
4.3 - 4.5		10.3 - 11.5		16.3 - 19.5		22.3 - 28.7		28.3 - 39.5	
4.4 - 4.6		10.4 - 11.6		16.4 - 19.6		22.4 - 28.9		28.4 - 39.7	
4.5 - 4.7		10.5 - 11.7		16.5 - 19.8		22.5 - 29.0		28.5 - 39.9	
4.6 - 4.8		10.6 - 11.9		16.6 - 19.9		22.6 - 29.2		28.6 - 40.1	
4.7 - 4.9		10.7 - 12.0		16.7 - 20.0		22.7 - 29.4		28.7 - 40.3	
4.8 - 5.0		10.8 - 12.1		16.8 - 20.2		22.8 - 29.5		28.8 - 40.4	
4.9 - 5.2		10.9 - 12.2		16.9 - 20.3		22.9 - 29.7		28.9 - 40.6	
5.0 - 5.3		11.0 - 12.3		17.0 - 20.5		23.0 - 29.9		29.0 - 40.8	
5.1 - 5.4		11.1 - 12.5		17.1 - 20.6		23.1 - 30.0		29.1 - 41.0	
5.2 - 5.5		11.2 - 12.6		17.2 - 20.8		23.2 - 30.2		29.2 - 41.2	
5.3 - 5.6		11.3 - 12.7		17.3 - 20.9		23.3 - 30.4		29.3 - 41.4	
5.4 - 5.7		11.4 - 12.9		17.4 - 21.1		23.4 - 30.5		29.4 - 41.6	
5.5 - 5.8		11.5 - 13.0		17.5 - 21.2		23.5 - 30.7		29.5 - 41.8	
5.6 - 5.9		11.6 - 13.1		17.6 - 21.4		23.6 - 30.9		29.6 - 42.0	
5.7 - 6.0		11.7 - 13.3		17.7 - 21.5		23.7 - 31.1		29.7 - 42.2	
5.8 - 6.2		11.8 - 13.4		17.8 - 21.7		23.8 - 31.2		29.8 - 42.5	
5.9 - 6.3		11.9 - 13.5		17.9 - 21.8		23.9 - 31.4		29.9 - 42.7	
6.0 - 6.4		12.0 - 13.6		18.0 - 22.0		24.0 - 31.6		30.0 - 42.9	
6.1 - 6.5		12.1 - 13.8		18.1 - 22.1		24.1 - 31.8		30.1 - 43.1	
6.2 - 6.6		12.2 - 13.9		18.2 - 22.2		24.2 - 31.9		30.2 - 43.3	
6.3 - 6.7		12.3 - 14.0		18.3 - 22.4		24.3 - 32.1		30.3 - 43.5	
6.4 - 6.8		12.4 - 14.2		18.4 - 22.5		24.4 - 32.3		30.4 - 43.7	
6.5 - 7.0		12.5 - 14.3		18.5 - 22.7		24.5 - 32.5		30.5 - 43.9	
6.6 - 7.1		12.6 - 14.4		18.6 - 22.9		24.6 - 32.6		30.6 - 44.1	
6.7 - 7.2		12.7 - 14.5		18.7 - 23.0		24.7 - 32.8		30.7 - 44.3	
6.8 - 7.3		12.8 - 14.7		18.8 - 23.2		24.8 - 33.0		30.8 - 44.5	
6.9 - 7.4		12.9 - 14.8		18.9 - 23.3		24.9 - 33.2		30.9 - 44.7	